NFC搭配微控制器的物聯網應用及設計方案

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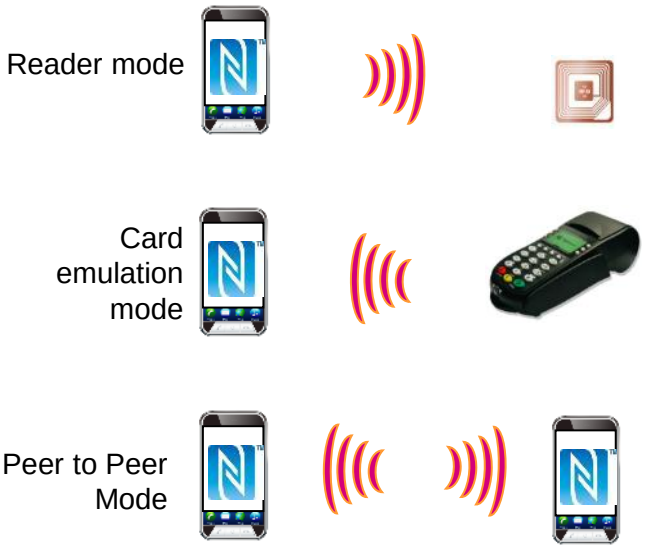
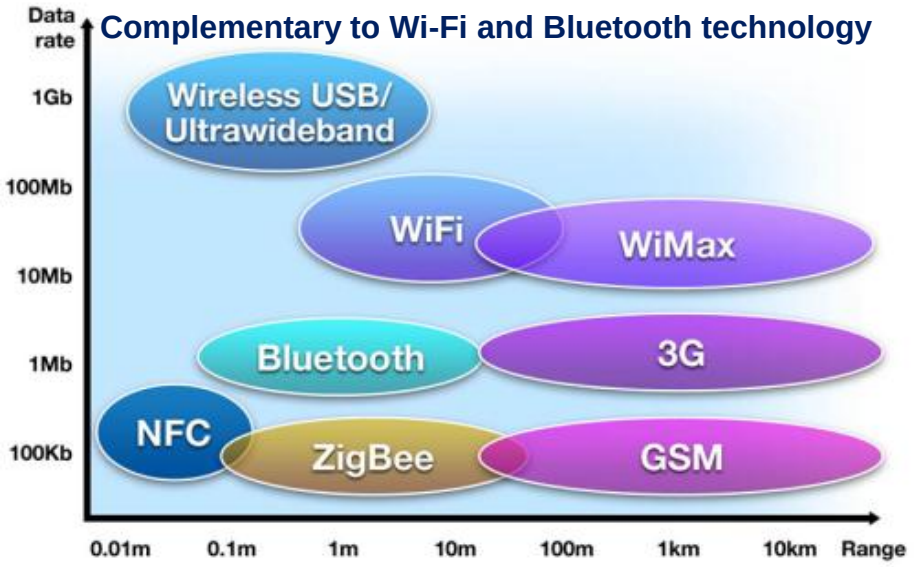
NFC Technology

NFC : Near Field Communication (近距離無線通訊)

- The NFC Forum, which was founded in 2004 by Nokia, Philips Semiconductors (has became NXP Semiconductors since 2006) and Sony, and now has more than 160 members.
- The NFC standard is defined in ISO/IEC 18092 with operating distance up to 20 cm
- Based on RFID technology at 13,56 MHz
- Data rate: 106 kbps(max. at current mobile phone), 212 kbps, 424 kbps
- NFC phone can act like
  - An RFID reader/writer
  - An RFID tag





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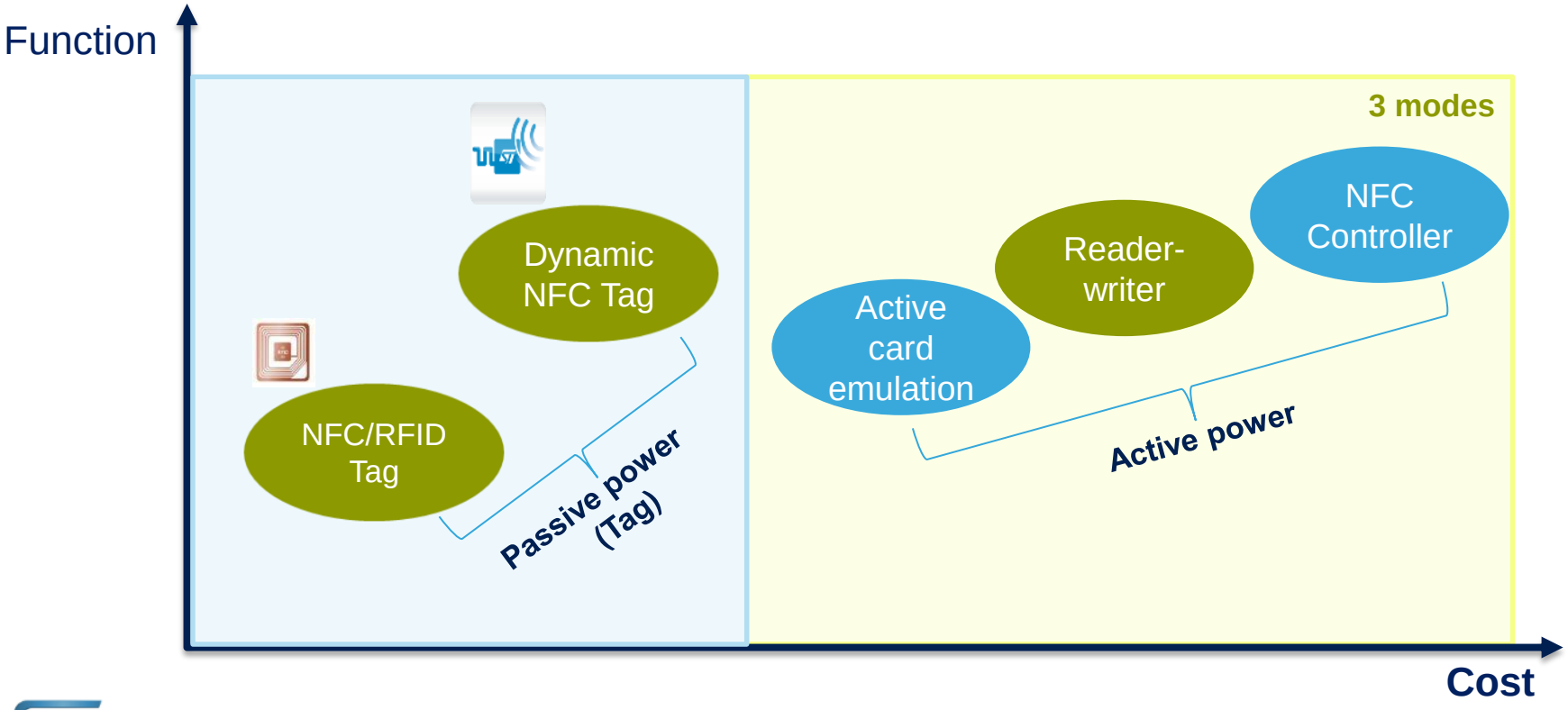
NFC 裝置分類

No need to use
NFC controller for
non-mobile applications



NFC Main Applications

Tap & Pay

PoS terminals, infrastructure NFC readers

Tap & Pair

Consumer, computer peripherals, accessories

Tap & Exchange

Home Appliance, Healthcare, Metering

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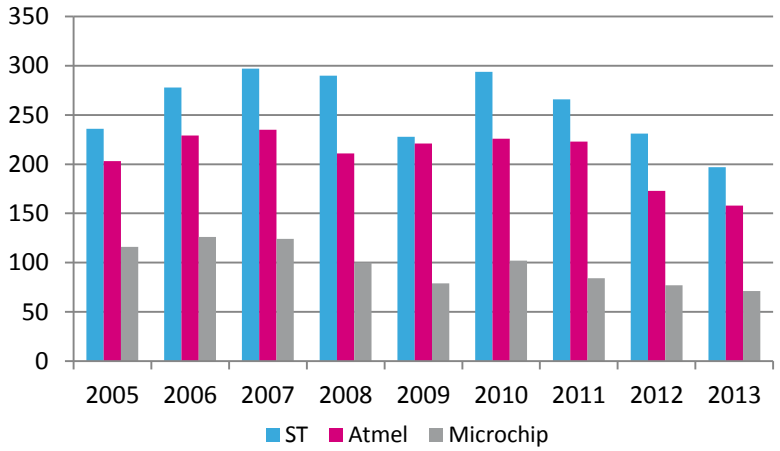
EEPROM Market

ST Nb.1 for 10 years

Nb.1 EEPROM Supplier
 # 25% share



Company Name	2005 Revenue (M$)	2006 Revenue (M$)	2007 Revenue (M$)	2008 Revenue (M$)	2009 Revenue (M$)	2010 Revenue (M$)	2011 Revenue (M$)	2012 Revenue (M$)	2013 Revenue (M$)	2013 share (%)
STMicroelectronics	236	278	297	290	228	294	266	231	198	24.8%
Atmel Corporation	203	229	235	211	221	226	223	173	158	19.8%
ROHM Semiconductor	80	72	65	54	20	26	20	19	79	9.9%
Microchip Technology	116	126	124	100	79	102	84	77	72	9.0%
ON Semiconductor	53	51	64	49	41	63	64	45	43	5.4%
Seiko Instruments	64	71	75	70	52	58	56	50	40	5.0%
Shanghai Fudan	16	11	10	9	10	14	10	10	10	1.3%
Renesas	15	16	25	22	20	26	11	6	3	0.4%
Shanghai Huahong	0	0	10	7	6	4	4	0	0	0.0%
NXP	0	86	120	127	115	129	131	144	147	18.4%
Infineon Technologies	103	87	58	39	24	39	53	51	37	4.6%
Others	76	80	66	61	39	49	21	12	11	1.4%
Total Semiconductor	**962**	**1,107**	**1,149**	**1,039**	**855**	**1,030**	**943**	**818**	**798**	100.0%

Source: IHS November 2013

- Strong market leader in all segment : #1 in automotive, #1 in standard EEPROM
- With 20 years history and focus on EEPROM, ST is a long term partner
- With ST 0.15µm process qualified for Automotive, ST keeps investing

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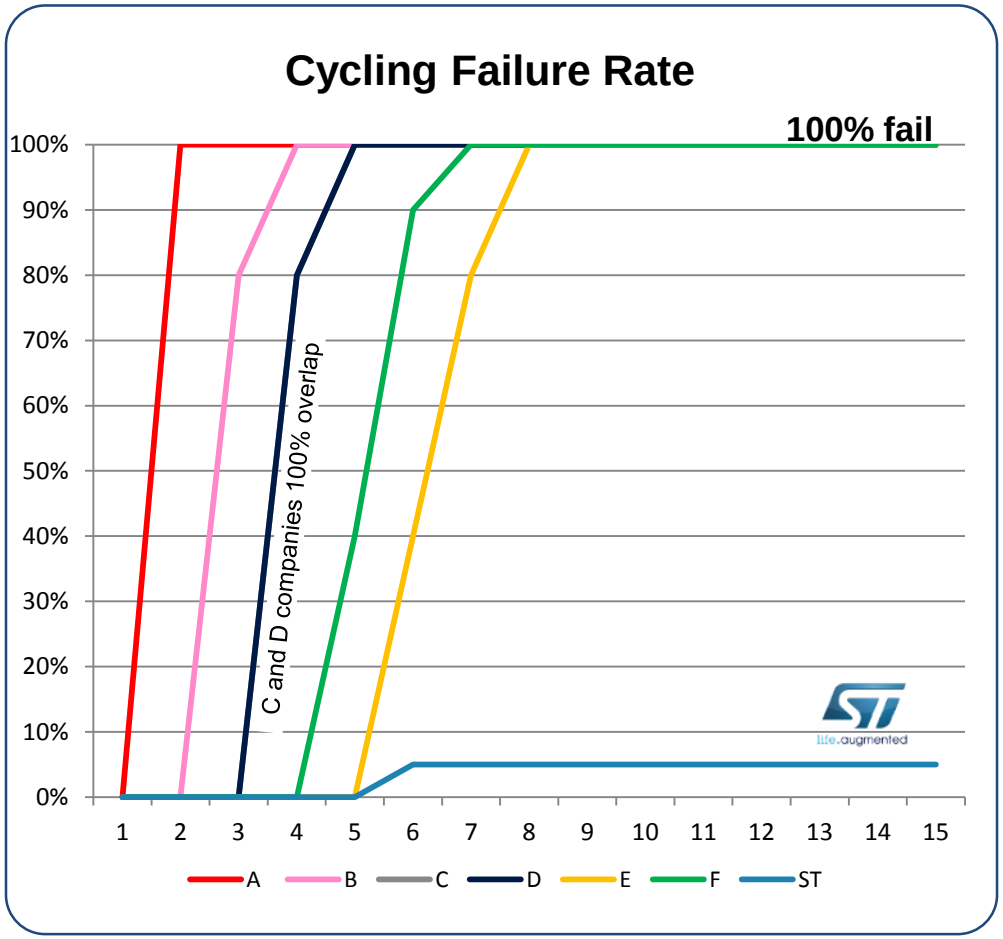
EEPROM R/W Cycle Benchmark



Tests performed with I²C 256Kb (5 to 20 samples for each company)

N°.1 ST (F8H process)

- Only 5% failure Rate at 15 Mcycles
- **The most robust!**

Other Companies with 100% Failure Rate since

- 2 Mcycles for A company
- 4 Mcycles for B company
- 5 Mcycles for C and D companies
- 7 Mcycles for F company
- 8 Mcycles for E company

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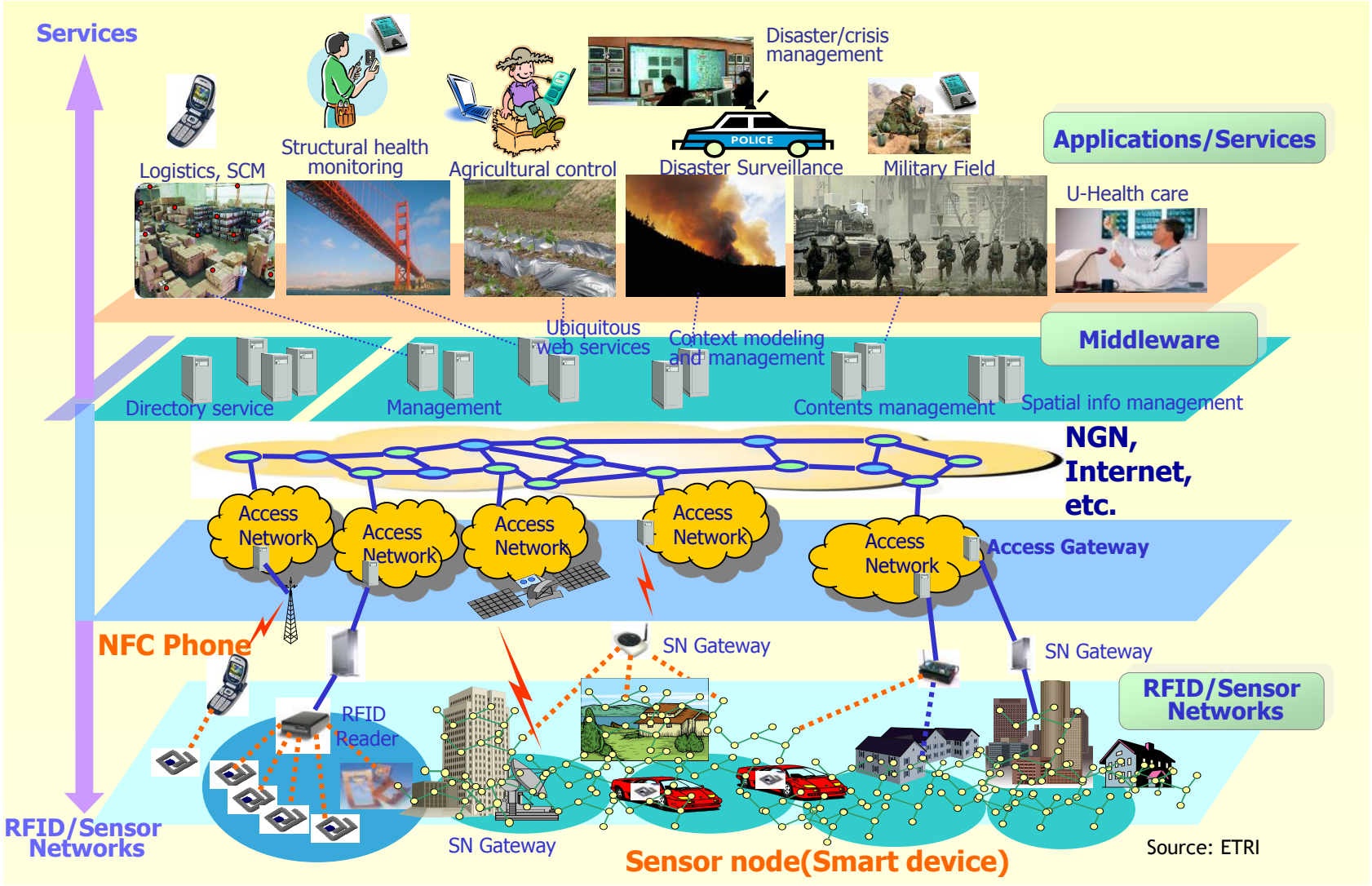
物聯網架構

IOT(Internet of thing) architecture



Source: ETRI

New Things to Augment Life

Smart City

Reduce traffic congestion

Better use of resources

Improve security

Smart Car

Reduce emissions

Increase safety

Save fuel

Smart Home

Make entertainment more interactive and immersive

Increase comfort

Save energy

Smart Me Healthcare

Empower patients

Help physicians monitor and diagnose remotely

Smart Me Fitness & Wellness

Help to lead healthier lives

Optimize sports performance

Early warning of illness

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Smart Dynamic NFC Device

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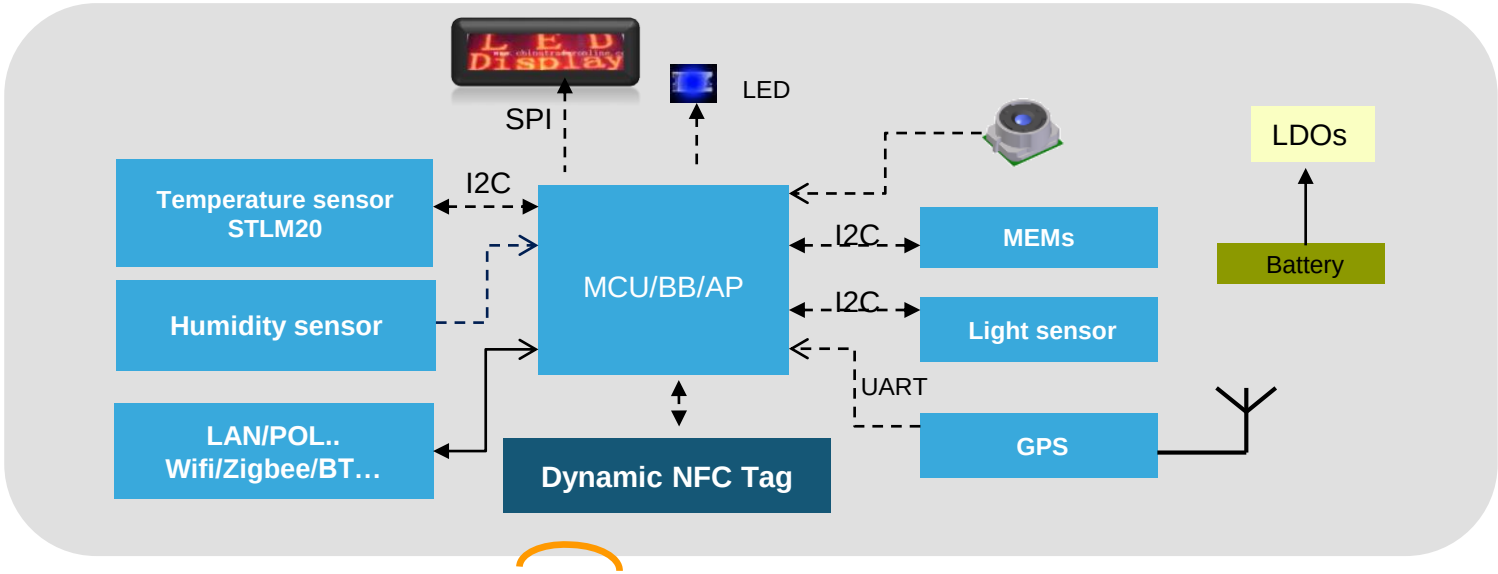
Smart Grid | Smart Appliances | Security | Automotive | Medical | Cold Chain /Logistics



- UID: identification
- No on-board power : saving energy for R/W
- Short read range : authorization, switch on/ cut off control
- Easy to use: tape for BT/Wifi pairing, data exchange

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Wide Range of Use Cases

- Convenient wireless pairing
  - Tap & Pair! Bluetooth or Wifi connection pairing / unpairing made convenient by just taping the phone to the dynamic NFC tag.

- Remote programming
  - Tap & Set! Take advantage of smartphones user interface to set appliances, home automation, healthcare and industrial equipment. Change default settings, cooking profile, activate warranty card …

- Data download
  - Tap & Download! Download your running data, your device user manual, the customer service contact information.

- Service maintenance
  - Tap & Diagnose! Enable / disable a device, repurpose it, download its maintenance records, error codes, activate new functions.

« Embedded NFC » Use Cases for IoT

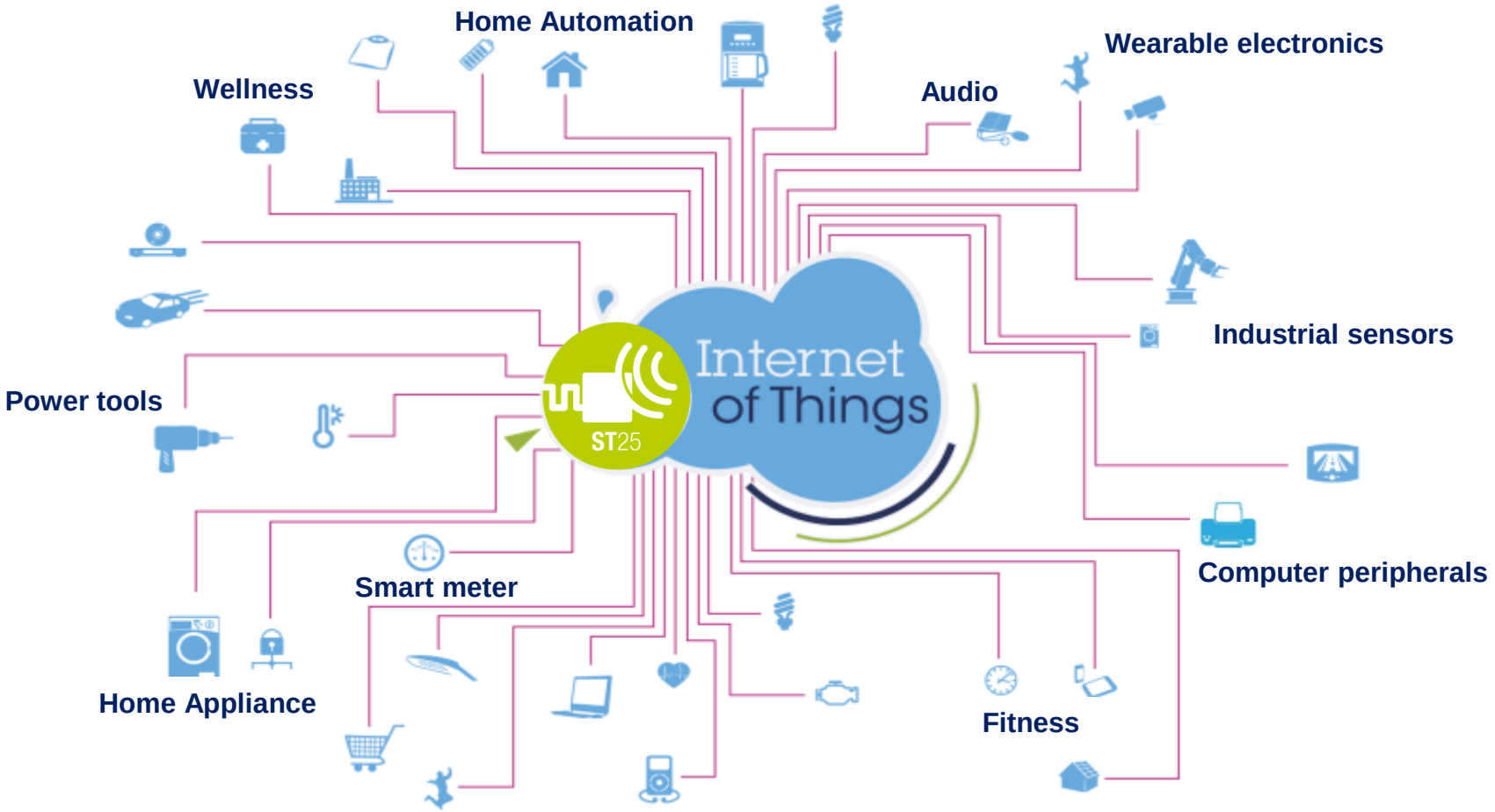
ST's dynamic NFC tags and transceivers…

… a broad range of use cases, in an affordable and easy-to-use device

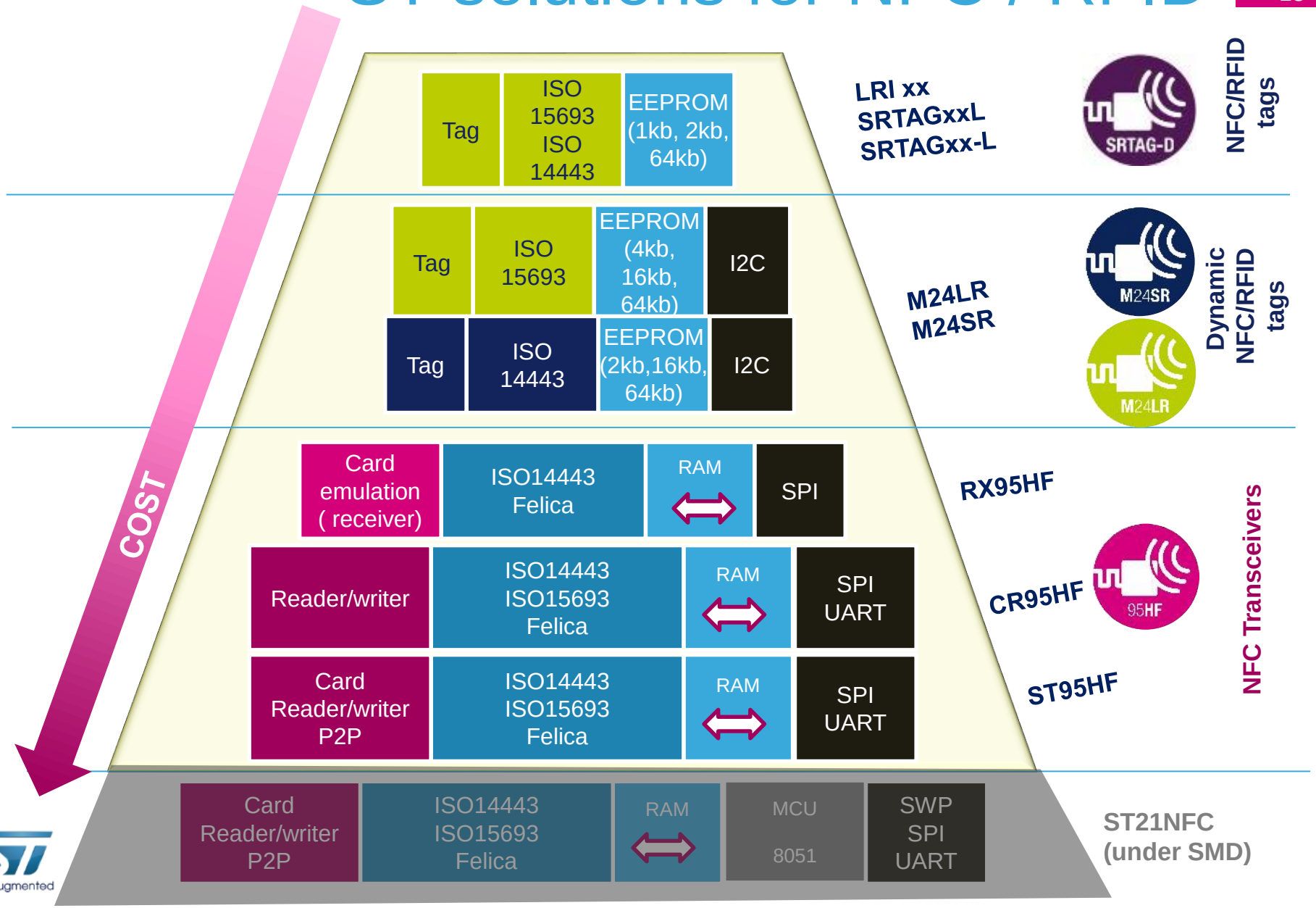
http://youtu.be/Z-9HtyhoxT8

ST NFC Memories and Transceivers

at the heart of Internet of Things



ST solutions for NFC / RFID



Product Part Numbers

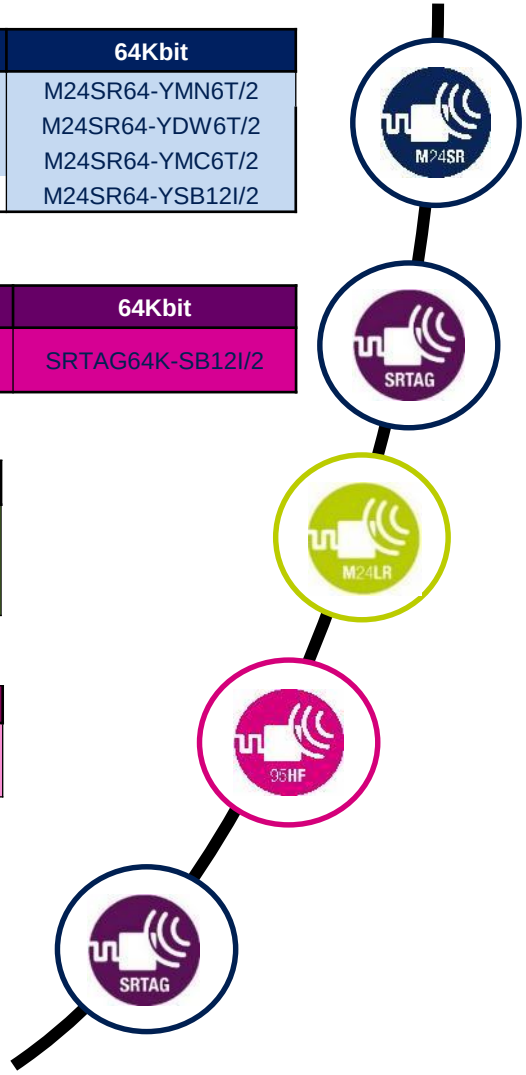
M24SR	Package	2Kbit	4Kbit	16Kbit	64Kbit
Dynamic NFC/RFID tag RF ISO14443A + I2C IF + GPO + RF disable	SO8	M24SR02-YMN6T/2	M24SR04-YMN6T/2	M24SR16-YMN6T/2	M24SR64-YMN6T/2
	TSSOP8	M24SR02-YDW6T/2	M24SR04-YDW6T/2	M24SR16-YDW6T/2	M24SR64-YDW6T/2
	MLP 2x3	M24SR02-YMC6T/2	M24SR04-YMC6T/2	M24SR16-YMC6T/2	M24SR64-YMC6T/2
	SBN12	M24SR02-YSB12I/2			M24SR64-YSB12I/2

SRTAG	Package	512bit	2Kbit	16Kbit	64Kbit
NFC/RFID tag RF ISO14443A	SBN12	SRTAG512L-SB12/5	SRTAG2KL-SB12/5	SRTAG16K-SB12I/2	SRTAG64K-SB12I/2

M24LR	Package	4Kbit	16Kbit	64Kbit
Dynamic NFC/RFID tag RF ISO15693 + I2C IF + GPO + Energy harvesting	SO8	M24LR04E-RMN6T/2	M24LR16E-RMN6T/2	M24LR64E-RMN6T/2
	TSSOP8	M24LR04E-RDW6T/2	M24LR16E-RDW6T/2	M24LR64E-RDW6T/2
	MLP 2x3	M24LR04E-RMC6T/2	M24LR16E-RMC6T/2	M24LR64E-RMC6T/2

95HF	Package	Card emulation	Reader	Transceiver
NFC transceivers NFC + SPI IF	QFN32	RX95HF-VMD5T	CR95HF-VMD5T	ST95HF-VMD5T

SRTAG-P	Package	2Kbit
Dynamic NFC/RFID tag RF ISO14443A + GPO	DFN5	SRTAG2KL-PMH6T/5
	SBN12	SRTAG2KL-PSB12/5



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Key Benefits of ST25TA

A few things about the key benefits of ST25TA

- Largest and strongest memory density choice
  - From 512-bit to 64-Kbit memory densities based on highly reliable memory with 200-year data retention and 1M erase/write cycles
- Broad range of features
  - Data protection thanks to 128-bit password in Write / Read access
  - Optional flexible 20-bit counter for Write or Read access tracking
  - Optional General Purpose Output (GPO) pin like RF Field Detection feature with active high level
- Best-in-class RF performance and range
- Extended temperature range from -40 to /+85°C
- Same internal 50pF tuning capacitance as main competitors for fast and easy replacement in terms of antenna design

Using ST NFC
on many Smart Devices

Consumer Electronics

Home Appliance

Phone / tablet accessories

Peripherals

Dataloggers

Gaming

Token cards

Electronic Shelf Labels

Wearable Device

Metering

Support Ecosystem and Kits

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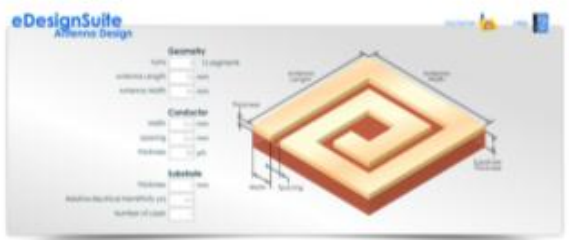
NFC Android App

Google play

Evaluation board

Antenna Design Suite



e2e community

M24SR SRTAG 95HF

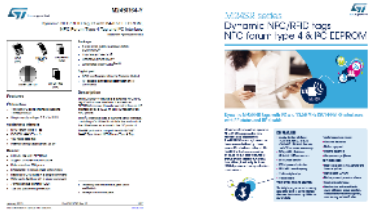
ST NFC memory support eco-system

Nucleo expansion

MCU drivers (FW)

```
/*****************************************/
int main(void)
{
/* Wait till HSE is ready */
  HSEStartUpStatus = RCC_WaitForHSEStartUp();
  if(HSEStartUpStatus == SUCCESS)
  {
   /* Enable Prefetch Buffer */
    FLASH_PrefetchBufferCmd(FetchBuffer_Enable);
```

Technical documentation



IBIS model

IBIS

www.st.com/nfc-rfid

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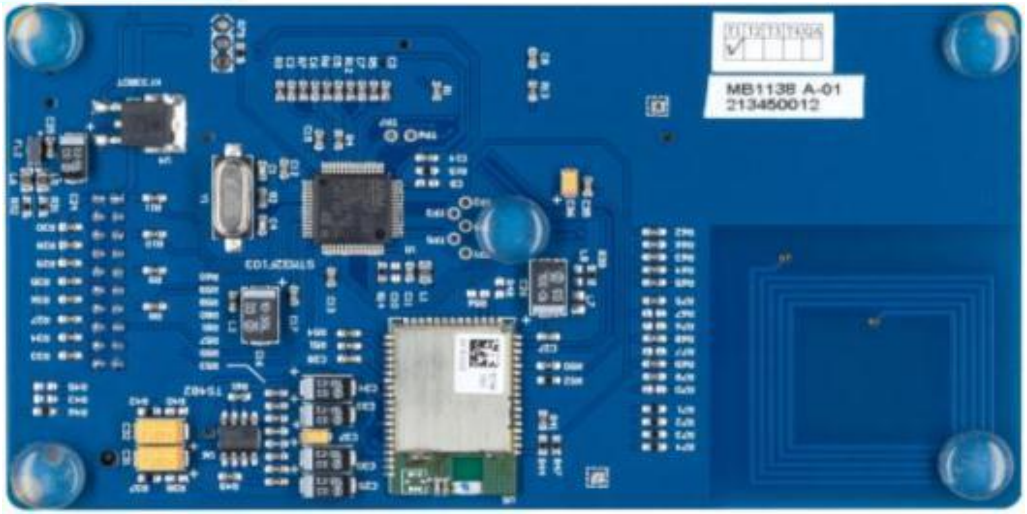
M24SR Discovery Kit

M24SR evaluation board

- M24SR64 dynamic NFC tag with 30x30mm antenna
- STM32F1 micro-controller
- Color display
- USB & JTAG connectors
- BT / audio module (premium)
- Audio headset (premium)

Reference: M24SR-DISCOVERY



http://www.st.com/web/en/catalog/tools/PF259659

M24SR Nucleo Expansion Board

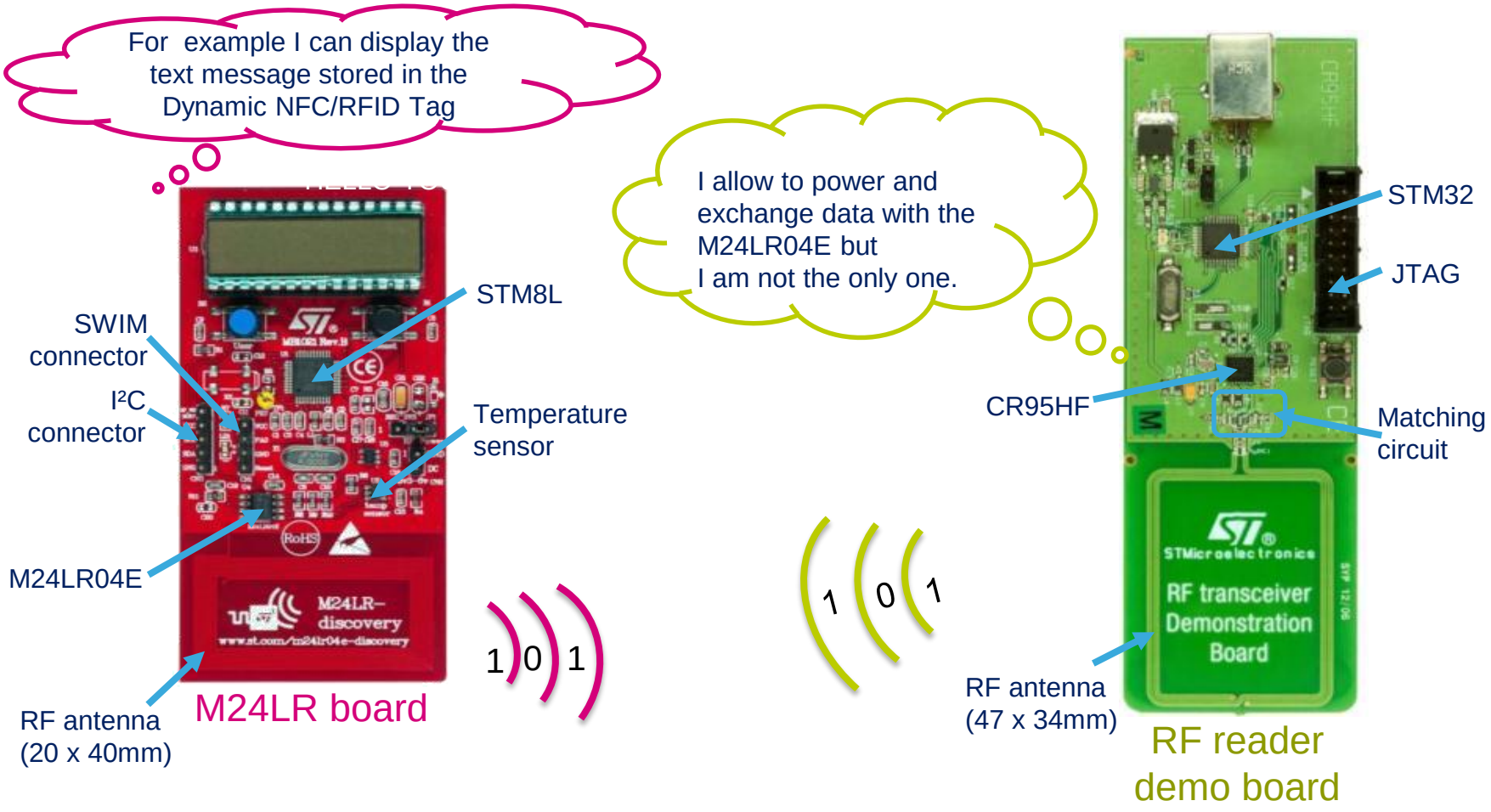
M24SR Nucleo expansion board

- M24SR64-Y dynamic NFC tag with 31x30mm double layer antenna
- Compatible with STM32 Nucleo boards
- Equipped with Arduino UNO R3 connector
- Powered through the Arduino UNO R3 connector
- 3 color LEDs for general purpose

Reference: X-NUCLEO-NFC01A1

http://www.st.com/web/en/catalog/tools/PF260759

CR95HF+M24LR Discovery Kit



Reference: M24LR-DISCOVERY

http://www.st.com/web/en/catalog/tools/PF253360

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Dynamic NFC / RFID Tags and Transceivers

Dynamic NFC / RFID tags and NFC transceivers

Enabling NFC connectivity for a broad range of applications in an affordable and easy-to-use device

Tape & Pair

Tape & Exchange

Tape & Pay

#1 in EEPROM and strong expertise in RF → reliable supplier (best-in-class quality and service)

Strong and long term commitment to a comprehensive NFC portfolio

Addressing a broad range of applications

- Consumer / Home appliance
- ESL / OTP card
- Healthcare / Wellness
- Industrial / Smart meter

Comprehensive NFC / RFID portfolio

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NFC for LED Driver

Programming Has Never Been Easier
PHILIPS
1. Take the driver out of the box. Locate the designated communication area on the driver.
2. Touch the LED driver to the programming device. Programming confirmation will appear on the monitor.
3. Install the driver into the fixture.

1. Constant voltage

Constant voltage power supply for LEDs
Brightness is not stable enough

2. Constant current

Constant current power supply for LEDs
Brightness is stable
Current volume impacts LED brightness

programing current parameter by Dynamic NFC Tag

3. PWM

Pulse voltage power supply for LEDs
More efficient
Different Freq PWM impacts LED brightness

programing PWM parameter by Dynamic NFC Tag

https://www.youtube.com/watch?v=Qc3XwdeBvSo&feature=youtu.be

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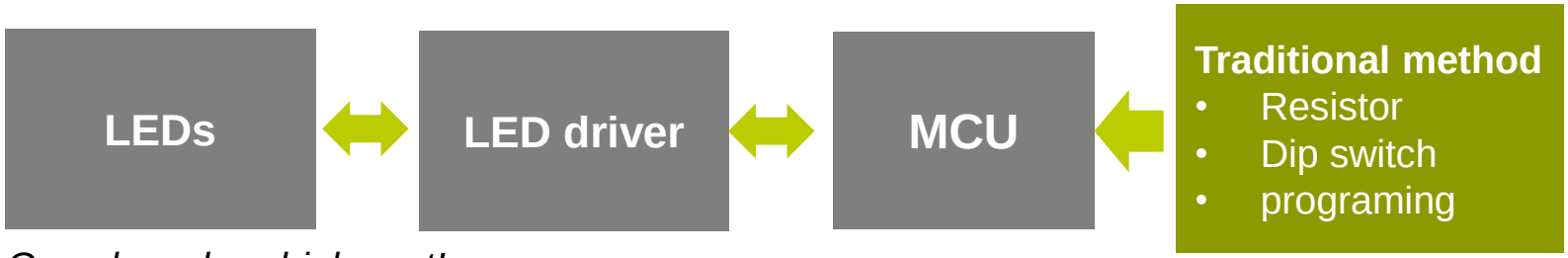
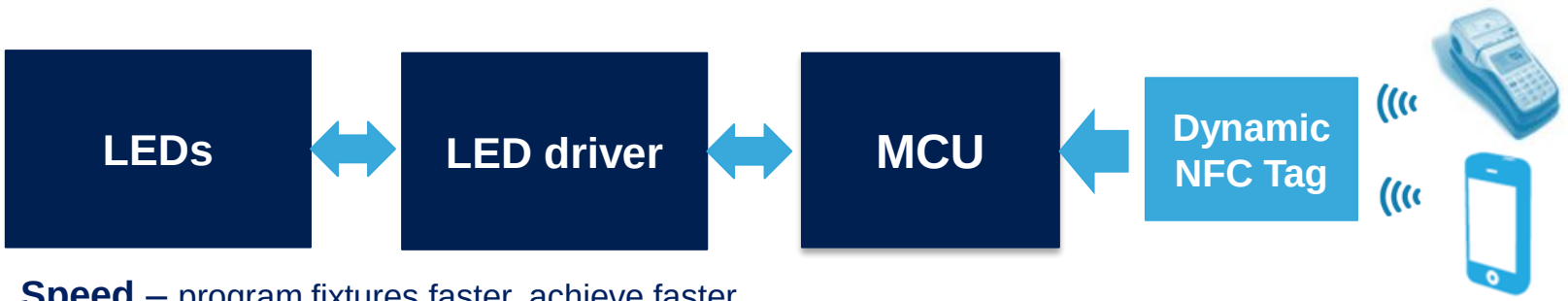
Benefits of NFC Programing

Traditional method programing



Complex, slow, high cost!

NFC programing



Speed – program fixtures faster, achieve faster

Flexibility – program at any stage in the manufacturing process

Reduce costs – meet a diverse set of customer needs without over-extending your SKUs

Simplicity – Deploy anywhere in the assembly process without complex training

Security - Set and protect proprietary info with dedicated memory space for OEM with password

Thank You!

For questions or further inquiries, please visit http://www.st.com/web/en/catalog/mmc/FM76/CL1766 or contact Kenneth.huang@st.com or eddie.wu@st.com